

CLAIMS

What is claimed is:

1. A method for *in vivo* detection of an analyte present in blood, comprising the steps of:

illuminating a portion of a sterile matrix beneath a nail by passing radiation from an optical source through the nail into the sterile matrix;

collecting optical radiation emitted by blood present in the illuminated portion of the sterile matrix; and

analyzing the collected radiation to determine if a selected analyte is present.

2. The method of Claim 1, wherein the analyte is selected from the group consisting of glucose, urea, cholesterol, triglycerides, total protein, albumin, hemoglobin, hematocrit, and bilirubin

3. The method of Claim 2, wherein the analyte is selected from the group consisting of glucose, urea, and cholesterol.

4. The method of Claim 3, wherein the analyte is glucose.

5. The method of Claim 1, wherein the nail is a fingernail.

6. The method of Claim 1, wherein the illuminating radiation has a wavelength in the range of approximately 400 nm to 2200 nm.

7. The method of Claim 1, wherein the optical source is a CW laser and the radiation has a wavelength in the range of approximately 600 nm to 900 nm.

8. The method of Claim 1, wherein the optical source is a laser operating at a fixed wavelength, and the collected radiation comprises Stokes Raman radiation.

9. The method of Claim 1, further comprising the step of:

interposing between the optical source and the nail a window plate and a gel or viscous liquid having a refractive index that is approximately equal to the refractive index of the nail, the gel or viscous liquid forming a homogenous optical surface with the nail and the window plate being in direct contact with the surface of the gel or viscous liquid distal from said nail.

10. The method of Claim 9, wherein the window plate has a refractive index that is approximately equal to the refractive index of the nail.

11. The method of Claim 1, wherein the radiation is analyzed by multi-variate regression analysis

12. The method of Claim 9, wherein the nail is a fingernail.

13. The method of Claim 1, wherein the sterile matrix is caused to be in a blood replete state by applying a pressure of from about one to about four Newtons to the top of a finger of which the sterile matrix forms a part.

14. The method of Claim 1, wherein the source radiation is multi-wavelength radiation, and the collected radiation is analyzed by reflection absorption spectroscopy.

15. The method of Claim 1, wherein the source radiation is multi-wavelength radiation, and the collected radiation is analyzed by optical coherence tomography.

16. A laminar structure for use in the detection of analytes present in a sterile matrix under a nail, comprising:

an optically transparent window plate having a first side and a second side, and
a gel or viscous liquid layer affixed to the first side of the window plate, the gel or viscous liquid layer having a refractive index approximately equal to the refractive index of the nail.

17. The structure of Claim 16, wherein the window plate has a refractive index approximately equal to the refractive index of the nail.

18. The structure of Claim 16 further comprising a film releaseably affixed to the second side of the window plate.

19. A plurality of the structures of Claim 16 separably affixed to each other in the form of a continuous strip.

20. An analytical system for *in vivo* identification and quantification of an analyte in blood, comprising:

a holder, the holder comprising a means for exerting pressure on a finger or toe inserted into the holder to induce pooling of blood in a sterile matrix under a nail on the finger or toe;

means for directing an incident excitation light beam to the finger or toe and through the nail and for focusing the beam at a focal point within the sterile matrix; and

collection optics for collecting light emitted from scattering interactions within the sterile matrix; and

an analyzer for quantifying the emitted light.